

Supplementary Material

Modeling the Cost Savings of Continuous Pulse Oximetry and Capnography Monitoring of United States Hospital General Care Floor Patients Receiving Opioids Based on the PRODIGY Trial

Table S1. Estimation of the average number of patients receiving opioids on the general care floor per hospital per year, using 2018 data from the Premier® Healthcare Database, including 742 United States hospitals.

Table S2. PRODIGY risk score distributions, length of stay, and healthcare cost for United States patients in PRODIGY trial, excluding outliers.

Table S3. Model of cost and length of stay savings when continuous pulse oximetry and capnography monitoring is implemented in patients with high, high or intermediate, or high, intermediate, or low risk for respiratory depression on the general care floor, derived based on the United States PRODIGY cohort with cost data available, excluding outliers.

Table S4. Institutional review board or ethics committee that approved the PRODIGY trial.

Figure S1. Annual cost savings (United States dollars) per patient predicted following implementation of continuous pulse oximetry and capnography monitoring on patients with high (blue line), high or intermediate (red line), or high, intermediate, or low (green line) risk for respiratory depression. Model based on A) United States PRODIGY cohort with cost data available; B) United States PRODIGY cohort with cost data available, excluding outliers.

Figure S2. A) Annual cost savings (United States dollars) and B) length of stay reduction predicted following implementation of continuous pulse oximetry and capnography monitoring on patients with high (blue line), high or intermediate (red line), or high, intermediate, or low (green line) risk for respiratory depression. Model was derived based on the United States PRODIGY cohort with cost data available, excluding outliers.

Figure S3. Probability of cost savings following implementation of continuous pulse oximetry and capnography monitoring on patients with high (blue line), high or intermediate (red line), or high, intermediate, or low (green line) risk for respiratory depression. Model was derived based on the United States PRODIGY cohort with cost data available, excluding outliers.

Figure S4. Deterministic sensitivity analysis to identify parameters with the most influence on cost savings. Analysis was derived based on A) United States PRODIGY cohort with cost data available; B) United States PRODIGY cohort with cost data available, excluding outliers. The most influential parameters on cost-savings have the widest bars.

Table S1. Estimation of the median number of patients receiving opioids on the general care floor per hospital per year, using 2018 data from the Premier® Healthcare Database, including 742 United States hospitals.

Patient Type	Medical	Surgical	Total
Total Number of Discharges	2,984,382	1,588,576	4,573,247
Number of Opioid Discharges	1,322,606	1,419,693	2,742,424
Unadjusted Percent Patients Receiving Opioids	44%	89%	60%
Projected Percent of Patients Receiving Opioids	44%	90%	60%
Median Number of Discharges per Hospital (95% CI)	2,654 (2,280-3,028)	1,413 (1,186-1,640)	4067 (3,477-4,657)
Median Number of Patients Receiving Opioids per Hospital (95% CI)	1,180 (1,014-1,346)	1,267 (1,064-1,470)	2,447 (2,092-2,802)

Abbreviations: 95% CI = 95% Confidence Interval

Table S2. PRODIGY risk score distributions, length of stay, and healthcare cost for United States patients in PRODIGY trial, excluding outliers.

PRODIGY Risk Score	Low (<8 points)	Intermediate (≥ 8 & <15 points)	High (≥ 15 points)
Patients in Risk Group (N=735)	35%	36%	30%
Patients with Respiratory Depression in Risk Group (N=735)	21%	34%	59%
Mean Length of Stay (Days) (N=735)			
Patients without Respiratory Depression Episodes	4.6 ± 4.0	5.5 ± 4.8	5.3 ± 3.8
Patients with ≥ 1 Respiratory Depression Episode	5.6 ± 3.8	6.5 ± 10.6	6.7 ± 6.8
Mean Hospital Cost (N=400)			
Patients without Respiratory Depression Episodes	$\$17,705 \pm \$11,818$	$\$18,858 \pm \$10,423$	$\$18,474 \pm \$9,767$
Patients with ≥ 1 Respiratory Depression Episode	$\$22,316 \pm \$13,679$	$\$21,665 \pm \$14,300$	$\$21,948 \pm \$9,128$

Table S3. Model of cost and length of stay savings when continuous pulse oximetry and capnography monitoring is implemented in patients with high, high or intermediate, or high, intermediate, or low risk for respiratory depression on the general care floor, derived based on the United States PRODIGY cohort with cost data available, excluding outliers.

Patient Monitoring Scenario	<u>All Patients: Standard of Care Intermittent Pulse Oximetry Monitoring</u>		<u>Low & Intermediate Risk Patients: Standard of Care Intermittent Monitoring;</u> <u>High Risk Patients: Continuous Pulse Oximetry and Capnography Monitoring</u>		<u>Low Risk Patients: Standard of Care Intermittent Monitoring;</u> <u>Intermediate & High Risk Patients: Continuous Pulse Oximetry and Capnography Monitoring</u>		<u>All Patients: Continuous Pulse Oximetry and Capnography Monitoring</u>	
Occurrence of ≥ 1 Respiratory Depression Episode	Patients with ≥ 1 Respiratory Depression Episode	Patients without Respiratory Depression Episodes	Patients with ≥ 1 Respiratory Depression Episode	Patients without Respiratory Depression Episodes	Patients with ≥ 1 Respiratory Depression Episode	Patients without Respiratory Depression Episodes	Patients with ≥ 1 Respiratory Depression Episode	Patients without Respiratory Depression Episodes
N Patients, by PRODIGY Risk Group								
Low	175/846	671/846	175/846	671/846	175/846	671/846	140/846	706/846
Intermediate	300/876	576/876	300/876	576/876	240/876	636/876	240/876	636/876
High	428/725	297/725	343/725	382/725	343/725	382/725	343/725	382/725
Cumulative Days in Hospital, by PRODIGY Risk Group								
Low	976	3,105	976	3,105	976	3,105	781	3,267
Intermediate	1,955	3,136	1,955	3,136	1,564	3,463	1,564	3,463
High	2,868	1,575	2,298	2,026	2,298	2,026	2,298	2,026
Cumulative Cost of Monitoring, by PRODIGY Risk Group								
Low	\$119	\$456	\$119	\$456	\$119	\$456	\$7,382	\$37,227
Intermediate	\$204	\$392	\$204	\$392	\$12,655	\$33,536	\$12,655	\$33,536
High	\$291	\$202	\$18,086	\$20,143	\$18,086	\$20,143	\$18,086	\$20,143
Cumulative Admission Cost, by PRODIGY Risk Group								
Low	\$3,905,213	\$11,880,136	\$3,905,213	\$11,880,136	\$3,905,213	\$11,880,136	\$3,124,170	\$12,499,815
Intermediate	\$6,499,572	\$10,862,156	\$6,499,572	\$10,862,156	\$5,199,658	\$11,993,631	\$5,199,658	\$11,993,631
High	\$9,393,860	\$5,486,834	\$7,528,257	\$7,057,141	\$7,528,257	\$7,057,141	\$7,528,257	\$7,057,141
Total Days in Hospital	13,615		13,496		13,432		13,398	

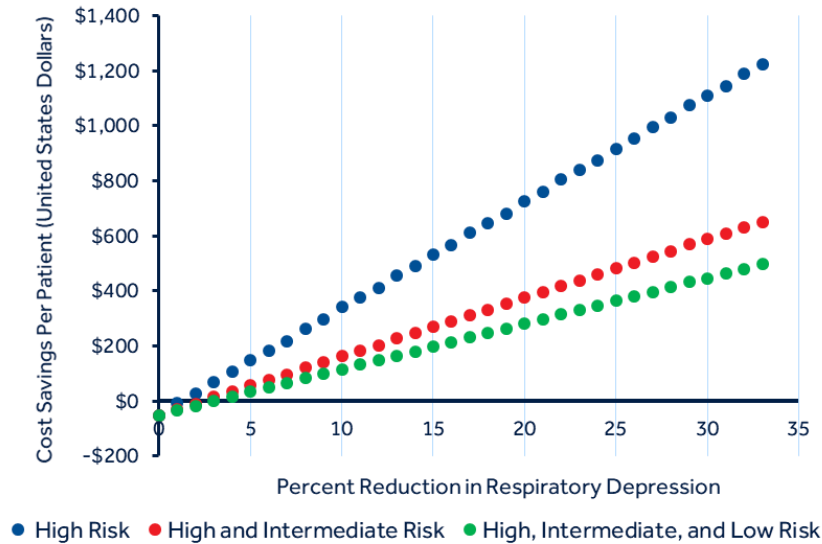
Patient Monitoring Scenario	<u>All Patients:</u> Standard of Care Intermittent Pulse Oximetry Monitoring	<u>Low & Intermediate Risk Patients:</u> Standard of Care Intermittent Monitoring; <u>High Risk Patients:</u> Continuous Pulse Oximetry and Capnography Monitoring	<u>Low Risk Patients:</u> Standard of Care Intermittent Monitoring; <u>Intermediate & High Risk Patients:</u> Continuous Pulse Oximetry and Capnography Monitoring	<u>All Patients:</u> Continuous Pulse Oximetry and Capnography Monitoring
Total Cost	\$48,029,434	\$47,771,874	\$47,649,030	\$47,531,701
Length of Stay Savings	<i>Reference</i>	119	183	216
Cost Savings	<i>Reference</i>	\$257,561	\$380,405	\$497,734
Percent Respiratory Depression Reduction Needed to Break Even	<i>Reference</i>	3%	4%	4.5%

Table S4. Institutional review board or ethics committee that approved the PRODIGY trial.

PRODIGY Trial Site	Institutional Review Board or Ethics Committee
Hopital Foch	CPP Ile de France 2
University Hospital Bonn	Ethik-Kommission Medizinische Fakultät
Okayama University Hospital	Rinshoushiken Shinsa Senmon Inkai
Jikei University	The Jikei Ethics Committee
University Medical Center, Maastricht	METC MUMC+
National University of Singapore	National Healthcare Group (NHG) Domain Specific Review Board (DSRB)
Hospital Clinico Universitario de Valencia	Comité de Ética del Hospital Clinico Universitario de Valencia
Beaumont Hospital	Western Institutional Review Board
Emory University	Western Institutional Review Board
Ohio State University Wexner Medical Center	Western Institutional Review Board
Providence Regional Medical Center	Western Institutional Review Board
Brigham and Women's Hospital	Partners Human Research Committee
Cleveland Clinic	Cleveland Clinic Institutional Review Board
MetroHealth Medical Center	The MetroHealth System Institutional Review Board
University at Buffalo	University at Buffalo Institutional Review Board
University at Colorado	Colorado Multiple Institutional Review Board

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a)



b)

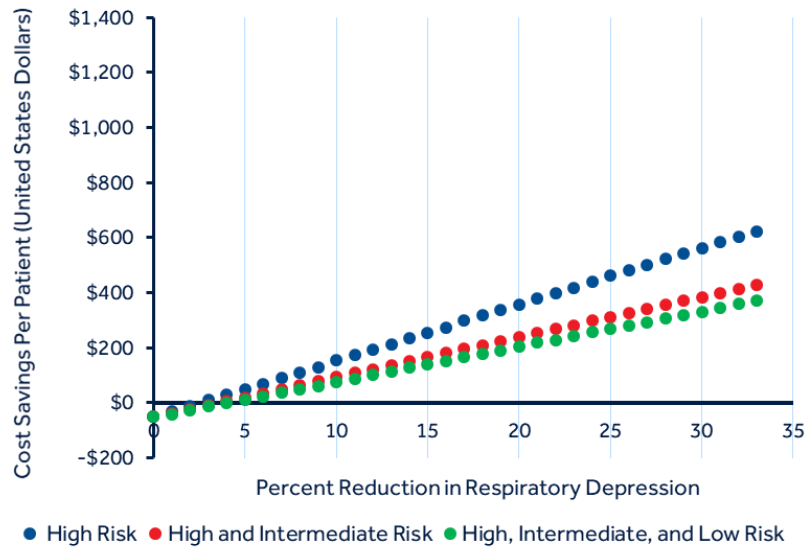
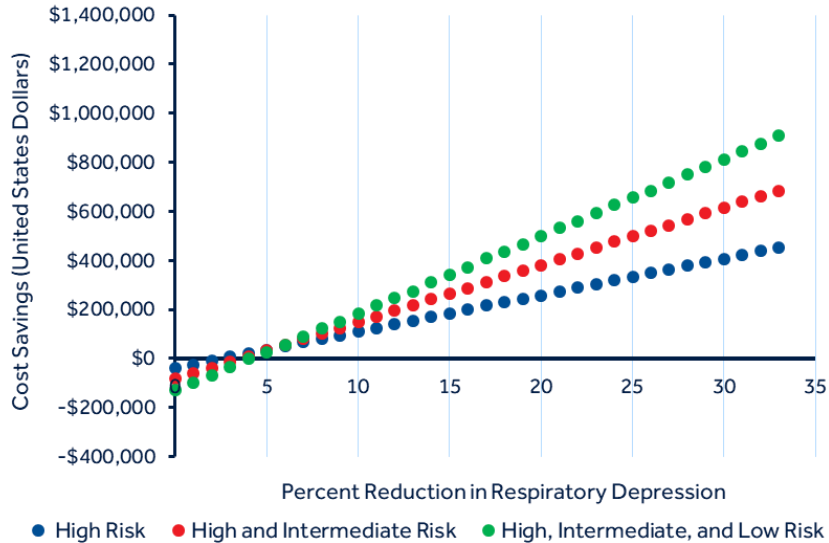


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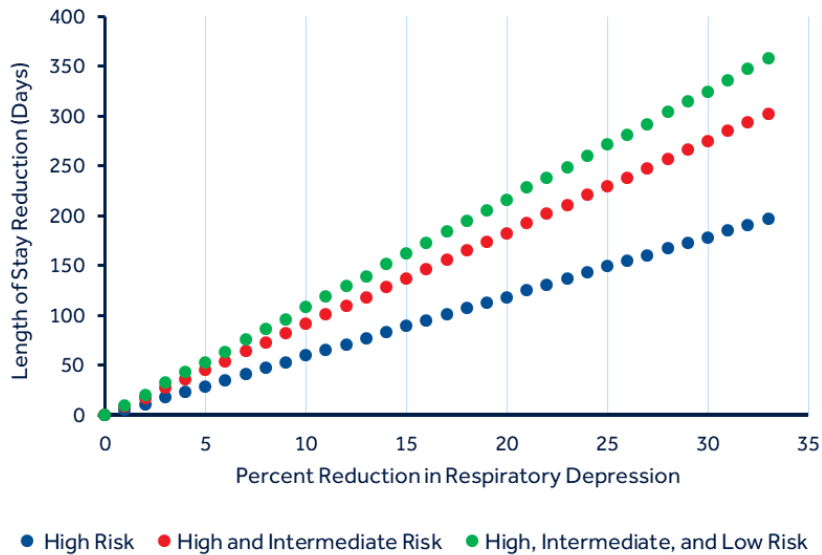


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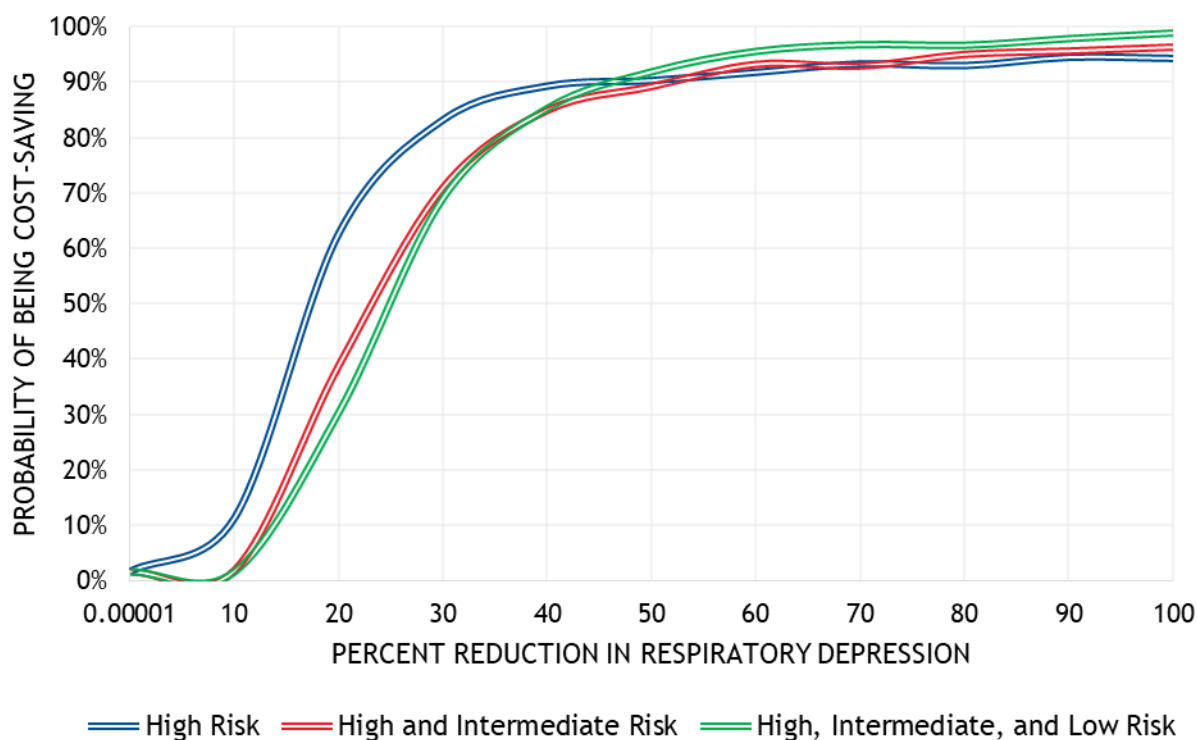
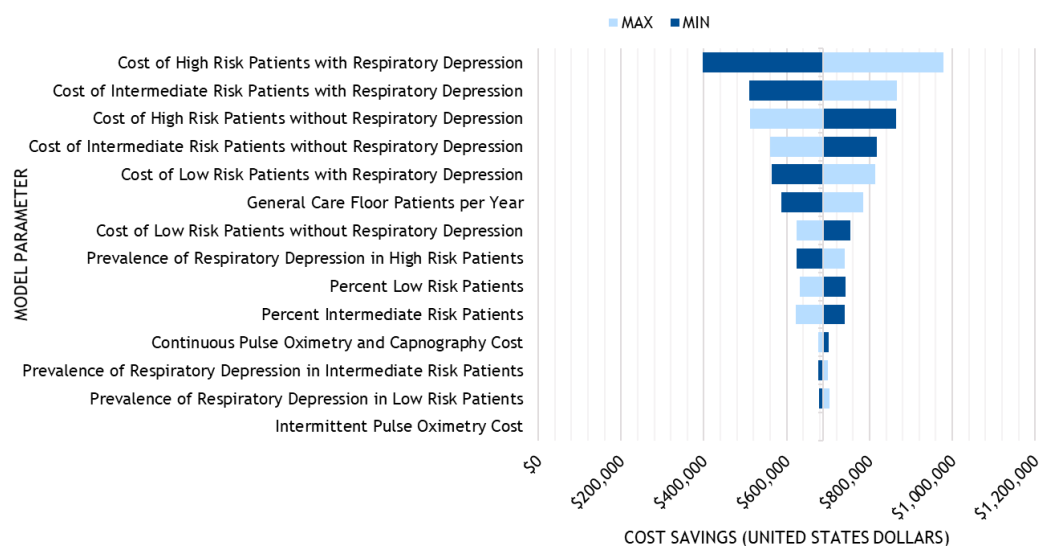


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a)



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